
NASA-15110 (October 2003)
NATIONAL AERONAUTICS NASA
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(March 2003)

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DIVISION 15 - MECHANICAL

SECTION 15110

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10/03

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SECTION 15110

VALVES
10/03

NOTE: Delete, revise, or add to the text in this
section to cover project requirements. Notes are
for designer information and will not appear in the
final project specification.

This section covers valves for steam and condensate
systems.

Standard valves for steam, water, etc., operating at
353 degrees F and 125-pounds per square inch gage
178 degrees C and 900 kilopascal working steam
pressure are covered in Section 15050 BASIC
MECHANICAL MATERIALS AND METHODS.

PART 1 GENERAL

1.1 REFERENCES

NOTE: The following references should not be
manually edited except to add new references.
References not used in the text will automatically
be deleted from this section of the project
specification.

The publications listed below form a part of this section to the extent
referenced:

AMERICAN WELDING SOCIETY (AWS)

AWS A5.13 (1989) Specification for Solid Surfacing
Welding Rods and Electrodes

ASME INTERNATIONAL (ASME)

ASME B1.20.1 (1983; R 1992) Pipe Threads, General
Purpose (Inch)

ASME B1.20.1M	(1983) Pipe Threads, Purpose (Metric)
ASME B16.1	(1998) Cast Iron Pipe Flanges and Flanged Fittings Classes 25, 125, and 250
ASME B16.34	(1996) Valves - Flanged, Threaded and Welding End

ASTM INTERNATIONAL (ASTM)

ASTM A 105/A 105M	(2001) Standard Specification for Carbon Steel Forgings for Piping Applications
ASTM A 106	(1999 e1) Standard Specification for Seamless Carbon Steel Pipe for High-Temperature Service
ASTM A 126/A 126M	(1995) Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings
ASTM A 182/A 182M	(1997; Rev C) Standard Specification for Forged or Rolled Alloy-Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service
ASTM A 216/A 216M	(1993; R 1998) Standard Specification for Steel Castings, Carbon, Suitable for Fusion Welding, for High Temperature Service
ASTM A 395	(1988) Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures
ASTM A 395M	(1988; R 1993) Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures (Metric)
ASTM A 436	(1984; R 1992) Standard Specification for Austenitic Gray Iron Castings
ASTM B 148	(1997) Standard Specification for Aluminum-Bronze Sand Castings
ASTM B 164	(1993) Standard Specification for Nickel-Copper Alloy Rod, Bar, and Wire
ASTM B 584	(1996) Standard Specification for Copper Alloy Sand Castings for General Applications
ASTM B 61	(1993) Standard Specification for Steam or

Valve Bronze Castings

ASTM B 62 (1993) Standard Specification for
Composition Bronze or Ounce Metal Castings

ASTM D 1784 (1999) Standard Specification for Rigid
Poly (Vinyl Chloride) (PVC) Compounds and
Chlorinated Poly (Vinyl Chloride) (CPVC)
Compounds

ISA - THE INSTRUMENTATION, SYSTEMS AND AUTOMATION SOCIETY (ISA)

ISA RP60.9 (1981) Piping Guide for Control Centers

MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS
INDUSTRY (MSS)

MSS SP-67 (1995) Butterfly Valves

MSS SP-70 (1998) Cast Iron Gate Valves, Flanged and
Threaded Ends

MSS SP-80 (1997) Bronze Gate, Globe, Angle and Check
Valves

MSS SP-86 (1987; R 1992) Guidelines for Metric Data
in Standards for Valves, Flanges, Fittings
and Actuators

NSF INTERNATIONAL (NSF)

NSF 14 (1990) Plastics Piping Components and
Related Materials

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

FS A-A-50457 (1989a) Valves Radiator, Heating Packless
Bonnet, Class 125 PSIG

FS WW-V-35 (Rev C) Valve, Ball

1.2 SUBMITTALS

NOTE: Review submittal description (SD) definitions
in Section 01330 SUBMITTAL PROCEDURES and edit the
following list to reflect only the submittals
required for the project. Submittals should be kept
to the minimum required for adequate quality
control. Include a columnar list of appropriate
products and tests beneath each submittal
description.

The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES in sufficient detail to show full compliance with the specification:

SD-02 Shop Drawings

Fabrication Drawings shall be submitted for the following in accordance with paragraph entitled, "General Requirements," of this section.

Valves
Accessories

Installation drawings for valves shall be in accordance with the paragraph entitled, "Installation," of this section.

SD-07 Certificates

Listing of Product Installation shall be submitted in accordance with paragraph entitled, "General Requirements," of this section.

Certificates shall be submitted for the following items showing conformance to the referenced standards contained in this section.

Gate Valves
Globe and Angle Valves
Check Valves
Cone-Plug Balancing Valve
Eccentric Plug Valves
Ball Valves
Dial Cocks
Diaphragm Control and Instrument Valves

1.3 GENERAL REQUIREMENTS

NOTE: If Section 15003 GENERAL MECHANICAL PROVISIONS is not included in the project specification, applicable requirements therefrom should be inserted and the first paragraph deleted. If Section 15055 WELDING MECHANICAL is not included in the project specification, applicable requirements therefrom should be inserted and the second paragraph deleted.

[Section 15003 GENERAL MECHANICAL PROVISIONS applies to work specified in this section.]

[Section 15055 WELDING MECHANICAL applies to work specified in this section.]

Fabrication Drawings shall be submitted for each type of Valves and Accessories used, meeting referenced standards contained within this

section.

Listing of Product Installation shall be submitted for valve assemblies indicating at least five installed units, similar to those proposed for use, that have been in successful service for a minimum of five years.

PART 2 PRODUCTS

2.1 COMPONENTS

2.1.1 Dial Cocks

Dial cocks in sizes 2-1/2-inch ips DN65 and smaller with pointer and etched position dial shall be rated 150-psi 1100 kilopascal working steam pressure (wsp) and shall be of manufacturer's standard all-brass construction.

2.1.2 Diaphragm Control and Instrument Valves (DCIV)

Diaphragm control and instrument valves in sizes 1/4 and 3/8 inch DN8 and DN10 shall have a forged-brass body with reinforced tetrafluoroethylene diaphragm, and an AISI 300 series corrosion-resistant steel spring with round phenolic handle. Handle shall be fitted with disks color-coded in accordance with ISA RP60.9.

2.2 FABRICATION

2.2.1 Gate Valves

NOTE: These valves are recommended for steam and condensate service.

2.2.1.1 350 psi 2500 kPa

Valves shall be rated 300 pounds per square inch (psi) 2100 kilopascal working steam pressure (wsp) and shall conform to ASME B16.34.

Body end connections shall be flanged for all valves larger than 2 inches DN50, unless butt weld ends are specified. [Screwed] [Socket] weld shall be used for sizes 2 inches DN50 and under to suit specified piping system end connection and maintenance requirements, or be welded. Flange faces shall have concentric serrated finish.

Body to bonnet connection shall be [union] [gasketed-bolted] type for valves 2 inches DN50 and under and gasketed-bolted type for valves larger than 2 inches DN50. Bonnet shall be outside screw and yoke (OS&Y) type, rising stem.

Body and bonnet assembly shall be [cast steel] [forged carbon steel]. Cast steel shall conform to ASTM A 216/A 216M, Grade WCB. Forged carbon steel shall conform to ASTM A 105/A 105M.

**NOTE: Select the following paragraph only after
checking flow coefficients.**

[Valves shall have a full port.]

Trim shall include [hard-surfaced solid] [one-piece flexible] wedge disc
and hard-surfaced seats. Stem shall be rising and backseating type.

Trim materials and hard-surfaced substrates shall [conform to ASTM A 182/A
182M, Grade F6] [shall be manufacturer's standard metallurgical equivalents
for the specified service].

Hard surfacing alloy shall conform to AWS A5.13, [Class RNiCr-B] [Class
RCoCr-B].

Packing shall be wire-reinforced, fiber braid impregnated with [30 percent
tetrafluoroethylene] [a corrosion-inhibiting lubricant specifically
suitable for service with stem material provided].

Valve wheels shall be [cast iron] [malleable iron] [wrought steel].

**NOTE: Drawings shall note all locations where an
integral bypass valve is required. Integral bypass
valves are used for valves larger than 6 inches DN150
and for smaller sizes where unusual warmup
operations will occur.**

Integral bypass globe valves shall be provided around valves larger than 6
inches DN150. Bypass valves shall be factory installed and shall be [butt]
[socket] welded end, conforming to the same requirements as the main valve,
except that in all cases valve seat and plug disk shall be hard surfaced
and seat shall be removable, replaceable type. Piping connections shall be
pressure tubing, conforming to Schedule 80 ASTM A 106, Grade [B] [C], and
without change of direction fittings, i.e., bent. Connection shall be to
valve bosses located to perform specified function. Valves with integral
bypass shall be shipped bolted to crates in a manner that will preclude
damage to bypass assembly.

**NOTE: Drawings shall note all locations where
integral drain valve is required. Integral drain
valves are particularly useful in tall risers and
shall be noted in all cases where required except
where valve size is less than 2 inches DN50, in
which case an independent drain shall be provided
immediately above the valve. Note pitch of
horizontal lines.**

Integral drain valve assembly shall be [factory] [field] installed.
Connection to main valve body shall be welded. Drain valve shall be

trimmed with manufacturer's standard hardened corrosion-resistant steel. Piping shall be pressure tubing conforming to ASTM A 106, Grade [B] [C]. Drain discharge shall be [capped] [plugged]; threaded closure assembly shall be made with tetrafluoroethylene tape.

2.2.1.2 150 psi 1100 kPa

Valves shall be rated 150-psi 1100 kilopascal (wsp) and shall conform to ASME B16.34.

Body end connections shall be flanged for all valves larger than 2 inches DN50 unless butt weld ends are specified. [Screwed] [Socket] weld shall be used for sizes 2 inches DN50 and under to suit specified piping system end connection and maintenance requirements. Flange faces shall have concentric serrated finish.

Body to bonnet connection shall be [union] [gasketed-bolted] type for valves 2 inches DN50 and under and gasketed-bolted type for valves larger than 2 inches DN50. Bonnet shall be OS&Y type, rising stem.

Body and bonnet assembly shall be [cast steel] [forged carbon steel]. Cast steel shall conform to ASTM A 216/A 216M, Grade WCB. Forged carbon steel shall conform to ASTM A 105/A 105M.

**NOTE: Select the following paragraph only after
checking flow coefficients.**

[Valves shall have a full port.]

Trim for valves larger than 2 inches DN50 shall include [hard surfaced solid] [one-piece flexible-wedge] disk and hard-surfaced seats. Trim for valves 2 inches DN50 and under shall include [hard-surfaced] [hardened-solid] [one-piece flexible wedge disk] and [hard-surfaced] [hardened seats]. Hardened components shall have Brinell hardness of not less than 500. Stem shall be rising and backseating type.

Trim materials and hard-surfaced substrates [shall conform to ASTM A 182/A 182M, Grade F6] [shall be manufacturer's standard metallurgical equivalents for the specified service].

Hard-surfacing alloy shall conform to AWS A5.13, [Class RNiCr-B] [Class RCoCr-B].

Packing shall be wire reinforced, fiber braid impregnated with [30 percent tetrafluoroethylene] [a corrosion-inhibiting lubricant specifically suitable for service with stem material provided].

Valve wheels shall be [cast iron] [malleable iron] [wrought steel].

**NOTE: Drawings shall note all locations where an
integral bypass valve is required. Integral bypass**

valves are used for valves larger than 6 inches DN150
and for smaller valves where unusual warmup
operations will occur.

Integral bypass globe valves shall be provided around valves larger than 6 inches DN150. Bypass valves shall be factory installed and shall be [butt] [socket] welded end, conforming to the same requirements as the main valve except that in all cases, valve seat and disk shall be hard-surfaced and seat shall be removable, replaceable type. Piping connections shall be pressure tubing, conforming to Schedule 80 ASTM A 106, Grade [B] [C], and without change of direction fittings; i.e., bent. Connection shall be to valve bosses located to perform specified function. Valves with integral bypass shall be shipped bolted to crates in a manner that will preclude damage to bypass assembly.

NOTE: Drawings shall note all locations where integral drain valve is required. Integral drain valves are particularly useful in tall risers and shall be noted in all cases where required except where valve size is less than 2 inches DN50, in which case an independent drain shall be provided immediately above the valve. Note pitch of horizontal lines.

Integral drain valve assembly shall be [factory] [field installed]. Main valve boss shall be factory drilled. Connection to main valve body shall be welded. Drain valve shall be trimmed with manufacturer's standard hardened corrosion-resistant steel. Piping shall be pressure tubing conforming to ASTM A 106, Grade [B] [C]. Drain discharge shall be [capped] [plugged], and threaded closure assembly shall be made with tetrafluoroethylene tape. All necessary handling and shipping care shall be provided.

2.2.1.3 125 psi 900 kPa

Valves shall be rated 125-psi 900 kilopascal (wsp) and shall conform to MSS SP-80 and MSS SP-86 wedge disc, rising stem, inside screw, 125-pound 900 kilopascal for sizes 2 inches DN50 and under and to MSS SP-70 for sizes over 2 inches DN50.

Body end connections shall be flanged for all valves larger than 2 inches DN50 and shall be screwed in sizes 2 inches DN50 and under to suit specified piping system end connection and maintenance requirements.

Valves, in sizes 2 inches DN50 and under, shall be union-bonnet type. Cast iron shall conform to ASTM A 126/A 126M, Class B.

Stem shall be rising and backseating type.

Packing shall be fiber braid impregnated with 30 percent tetrafluoroethylene.

Valve wheels shall be [cast iron] [malleable iron] [wrought steel].

NOTE: The following materials selection may be desirable as a means of eliminating dissimilar metal couples in a corrosive condensate. Forged steel valve cost premium on per-unit basis is approximately 100 percent.

Coordinate the following selection with appropriate selections for 150 1100 service valves.

For condensate service, screwed-end gate valves shall be 150-psi 1100 kilopascal, wsp-rated, forged steel, conforming to ASME B16.34, except that trim shall be manufacturer's standard corrosion-resistant steel.

NOTE: Drawings shall note all locations where an integral bypass valve is required. Integral bypass valves are used for valves larger than 6 inches DN150 and where warmup operations will occur.

Integral bypass globe valves shall be provided around valves larger than 6 inches DN150. Main valve body taps shall be factory installed. Bypass valves shall be globe type, [factory] [field] installed, and shall be socket welded end conforming to ASME B16.34, except that in all cases, valve seat and plug disk shall be hard-surfaced and seats shall be removable replaceable type. Piping connections shall be pressure tubing, conforming to Schedule 80 ASTM A 106, Grade [B] [C], and without change of direction fittings; i.e., bent, and shall include a socket welded end 3,000-psi-rated 20700 kilopascal, forged steel union with corrosion-resistant steel insert. Connection shall be to valve bosses located to perform specified function. Valves with integral bypass shall be shipped bolted to crates in a manner that will preclude damage to bypass assembly.

NOTE: Drawings shall note all locations where integral drain valve is required. Integral drain valves are particularly useful in tall risers and shall be noted in all cases where required except where valve size is less than 2 inches DN50, in which case an independent drain shall be provided immediately above the valve. Note pitch of horizontal lines.

Integral drain valves shall be provided. Main valve boss penetration shall be factory finished, and drain assembly shall be [factory] [field] installed. Drain valve shall be gate type. Piping shall be pressure tubing conforming to ASTM A 106, Grade [B] [C]. Drain discharge shall be

[capped] [plugged], and threaded closure assembly shall be made with tetrafluoroethylene tape.

2.2.2 Globe and Angle Valves

NOTE: These valves are recommended for steam and condensate service.

2.2.2.1 350 psi 2500 kPa

Valves shall be rated 300-psi 2100 kilopascal (wsp) and shall conform to ASME B16.34.

Body end connections shall be flanged for all valves larger than 2 inches DN50, unless butt weld ends are specified. [Screwed] [Socket] weld shall be used for sizes 2 inches DN50 and under to suit specified piping system end connection and maintenance requirements. Flange faces shall have concentric serrated finish.

Body to bonnet connection shall be [union] [gasketed-bolted] type for valves 2 inches DN50 and under; gasketed-bolted type for valves larger than 2 inches; DN50; and for valves 3/8 inch DN10 and under, assembly shall be screwed type. Bonnet shall be OS&Y type, except that valves 3/8 inch DN10 and under shall be inside screw type.

Body and bonnet assembly shall be [cast steel] [forged carbon steel]. Cast steel shall conform to ASTM A 216/A 216M, Grade WCB. Forged carbon steel shall conform to ASTM A 105/A 105M.

Trim shall include hard-surfaced plug disk and hard-surfaced seats. Stem shall be rising and backseating type.

Trim materials and hard surface substrates shall [conform to ASTM A 182/A 182M, Grade F6] [be manufacturer's standard metallurgical equivalents for the specified service].

Hard-surfacing alloy shall conform to AWS A5.13, [Class RNiCr-B] [Class RCoCr-B].

Packing shall be wire reinforced, fiber braid impregnated with [30 percent tetrafluoroethylene] [a corrosion-inhibiting lubricant specifically suitable for service with stem material provided].

Valve wheels shall be [cast iron] [malleable iron] [wrought steel].

NOTE: Drawings shall note all locations where integral drain valve is required. Integral drain valves are particularly useful in risers and shall be noted in all cases where required except where valve size is less than 2 inches DN50, in which case an independent drain shall be provided immediately

above the valve. Note pitch of horizontal lines.

Integral drain valves shall be provided. Main valve boss penetration shall be factory finished and drain assembly shall be [factory] [field] installed. Connection to main valve body shall be welded. Drain valve shall be trimmed with manufacturer's standard hardened corrosion-resistant steel. Piping shall be pressure tubing, conforming to ASTM A 106, Grade [B] [C]. Drain discharge shall be [capped] [plugged], and threaded closure assembly shall be made with tetrafluoroethylene tape.

2.2.2.2 150 psi 1100 kPa

Valves shall be rated 150-psi 1100 kilopascal working steam pressure (wsp) and shall conform to ASME B16.34.

Body end connections shall be flanged for all valves larger than 2 inches DN50, unless butt weld ends are indicated. [Screwed] [Socket] weld shall be used for sizes 2 inches DN50 and under to suit specified piping system end connection and maintenance requirements. Flange faces shall have concentric serrated finish.

Body to bonnet connection shall be [union] [gasketed-bolted] type for valves 2 inches DN50 and under; gasketed-bolted type for valves larger than 2 inches DN50; and for valves 3/8 inch DN10 and under, assembly shall be screwed type. Bonnet shall be OS&Y type, except that valves 3/8 inch DN10 and under shall be inside screw type.

Body and bonnet assembly shall be [cast steel] [forged carbon steel]. Cast steel shall conform to ASTM A 216/A 216M, Grade WCB. Forged carbon steel shall conform to ASTM A 105/A 105M.

Trim for valves larger than 2 inches DN50 and for all sizes of valves in bypass service shall include hard-surfaced, solid plug disk and hard-surfaced seats. Plug material in valves 2 inches DN50 and under shall be [as specified for valves larger than 2 inches DN50] [in accordance with AISI 400 series corrosion-resistant steel hardened to not less than 500 Brinell]. Stem shall be rising and backseating type.

Trim materials and hard surface substrates [shall conform to ASTM A 182/A 182M, Grade F6] [shall be manufacturer's standard metallurgical equivalents for the specified service].

Hard-surfacing alloy shall conform to AWS A5.13, [Class RNiCr-B] [Class RCoCr-B].

Packing shall be wire reinforced, fiber braid impregnated with [30 percent tetrafluoroethylene] [a corrosion-inhibiting lubricant specifically suitable for service with stem material provided].

Valve wheels shall be [cast iron] [malleable iron] [wrought steel].

NOTE: Drawings shall note all locations where

integral drain valve is required. Integral drain valves are particularly useful in tall risers and shall be noted in all cases where required except where valve size is less than 2 inches, DN50, in which case an independent drain shall be provided immediately above the valve. Note pitch of horizontal lines.

Integral, drain-valves assembly shall be [factory] [field] installed. Main valve boss shall be factory drilled. Connection to main valve body shall be welded. Drain valve shall be trimmed with manufacturer's standard hardened corrosion-resistant steel. Piping shall be pressure tubing conforming to ASTM A 106, Grade [B] [C]. Drain discharge shall be [capped] [plugged]. Threaded closure assembly shall be made with tetrafluoroethylene tape.

2.2.2.3 125 psi 900 kPa

Valves shall be rated 125-psi 900 kilopascal (wsp) and shall conform to MSS SP-80, MSS SP-86, [globe] [angle], [125] [150]-pound. [900] [1100] kilopascal.

Body end connections shall be flanged for all valves larger than 2 inches DN50 and shall be screwed for sizes 2 inches DN50 and under.

Valves 2 inches DN50 and under in size shall be union bonnet type.

Cast iron shall conform to ASTM A 126/A 126M, Class B.

Stem shall be rising and backseating type.

Composition seating surface disc construction may be substituted for metal plug disc connection.

NOTE: Select the following paragraph for large pressure regulating stations.

[Pressure regulating station bypass valves shall be 150 psi 1100 kilopascal.]

NOTE: Select the following paragraph for miscellaneous high-pressure drop throttling.

[Plug material for throttling valves 2 inches DN50 and under shall be AISI 400 series corrosion-resistant steel hardened to not less than 500 Brinell.]

Packing shall be fiber braid impregnated with 30 percent tetrafluoroethylene.

Valve wheels shall be [cast iron] [malleable iron] [wrought steel].

NOTE: Drawings shall note all locations where integral drain valve is required. Integral drain valves are particularly useful in tall risers and shall be noted in all cases where required, except where valve size is less than 2 inches DN50 in which case an independent drain shall be provided immediately above the valve. Note pitch of horizontal lines.

Integral drain valves shall be provided. Main valve boss penetration shall be factory finished and drain assembly shall be [factory] [field] installed. Drain valve shall be gate type. Piping shall be pressure tubing conforming to ASTM A 106, Grade [B] [C]. Drain discharge shall be [capped] [plugged], and threaded closure assembly shall be made with tetrafluoroethylene tape. All necessary handling and shipping care shall be provided.

2.2.2.4 Type A Rated 6000 psi 41400 kPa WOG

Valves shall be Y-body globe type rated 2,500-psi wsp and 6,000-psi 17300 kilopascal wsp and 41400 kilopascal wog with seal-guided disc, [hard-surfaced integral] [inserted and welded seats] hard-surfaced body backseating, loose backseat, swing-eye gland bolts, and malleable-iron, impact-type, valve wheels and handles.

Body and bonnet assembly shall be forged corrosion-resistant steel conforming to ASTM A 182/A 182M, Grade F 316.

Trim shall conform to ASTM A 182/A 182M, Grade F 316.

Bronze stem bushing shall conform to ASTM B 148, C95300, heat treated or as approved.

NOTE: Select one of the following two paragraphs after checking flow coefficient.

[Valves shall have a full port.]

[Valves shall have [full] [reduced] ports.]

Valve body shall have butt weld ends except that valves 1-1/2-inch DN40 iron pipe size (ips) and smaller shall be socket weld end type.

2.2.2.5 Type B Rated 6000 psi 41400 kPa WOG

Valves shall be Y-body type, piston check, rated 2,500-psi wsp and 6,000-psi wog 17300 kilopascal wsp and 41400 kilopascal wog; [seal welded] [pressure seal bonnet], hard-surfaced, spring-loaded, body guided disk; and [hard-surfaced integral] [inserted and welded seat].

Body and bonnet assembly shall be forged corrosion-resistant steel conforming to ASTM A 182/A 182M, Grade F 316.

Trim shall conform to ASTM A 182/A 182M, Grade F 316.

Spring shall be corrosion-resistant steel.

Valve body shall have butt weld ends, except that valves 1-1/2 inch DN40 ips and smaller shall be socket-weld end type.

2.2.2.6 Type A 2000 psi 13800 kPa WOG

Valves shall be globe type rated 600-psi wsp and 2,000-psi wog 4200 kilopascal wsp and 13800 kilopascal wog, with union, [seal welded] [pressure sealed bonnet] OS&Y, hard-surfaced, loose disc, hard surfaced seat, minimum 375 Brinell backseating, loose backseat where required for access, and a malleable iron [hand wheel] [handle]. Body and bonnet assembly shall be forged corrosion-resistant steel conforming to ASTM A 182/A 182M, Grade F 316.

Trim shall [conform to ASTM A 182/A 182M, Grade F 316] [be manufacturer's standard equivalent materials for the specified service].

Valve body shall have butt weld ends, except that valves 1-1/2 inch DN40 ips and smaller may be socket-weld end type.

2.2.3 Check Valves

NOTE: These valves are recommended for steam and condensate service.

2.2.3.1 350 psi 2500 kPa

Valves shall be rated 300-psi 2100 kilopascal wsp and shall conform to applicable portions of ASME B16.34.

Valves shall be horizontal swing-check type.

Body end connections shall be flanged for all valves larger than 2 inches DN50 unless butt weld ends are specified. [Screwed] [Socket] weld shall be used for sizes 2 inches DN50 and under to suit specified piping system end connection and maintenance requirements. Flange faces shall have concentric serrated finish.

Body to cover connection shall be [union] [gasketed-bolted] type.

Body and bonnet assembly shall be [cast steel] [forged carbon steel]. Cast steel shall conform to ASTM A 216/A 216M, Grade WCB. Forged carbon steel shall conform to ASTM A 105/A 105M.

Trim materials, including hinge pin, shall be manufacturer's standard

corrosion-resistant alloys for the specified service.

2.2.3.2 125 psi 900 kPa

Valves shall be rated 125-psi 900 kilopascal wsp and standard horizontal swing type shall conform to MSS SP-80, MSS SP-86, swing check, 125-pound. 900 kilopascal.

Body end connections shall be flanged for all valves larger than 2 inches and screwed in sizes 2 inches DN50 and under.

Body to cover connection in sizes larger than 2 inches DN50 shall be gasketed-bolted type, and valve body shall be [cast iron, conforming to ASTM A 126/A 126M, Class B] [Class 1 [125-psig, wsp at 353 degrees F; 200-psig Class 1, at 178 degrees C; 1379 kilopascal water, oil and gas (wog), nonshock] valves conforming to MSS SP-70]. Flanges shall conform to ASME B16.1.

Swing-check pin shall be corrosion-resistant [steel] [bronze] [brass]. Swing check angle of closure shall be manufacturer's standard, unless a specific angle is indicated.

Valve disk shall be [regrindable metal] [renewable composition] type.

2.2.3.3 Manual Radiator Valves

**NOTE: The following paragraph applies to steam and
hot water systems.**

Valves to control heating using medium heating element shall be packless type, conforming to FS A-A-50457, Type II, Style D metallic diaphragm seal metallic diaphragm seal, using MSS SP-86 (FS A-A-50457, Type II, Style D).

2.2.4 CONE-PLUG BALANCING VALVE (CPBV)

Cone-plug balancing valves in sizes through 1-1/4 inches DN32 shall be thread end, conforming to ASME B1.20.1 and ASME B1.20.1M, and shall be rated for service at not less than 175 psi at 250 degrees F 1207 kilopascal at 121 degrees C. Valve body and components shall be [ASTM B 61 bronze] [manufacturer's equal-strength brass materials]. Valve plug shall be swivel-type contoured cone and shall not rattle or make noise in service at any balancing position. Valve shall have high temperature, service-rated packing, with bushing in bottom of gland and gland adjustment. Valves shall be fitted with a memory device which shall permit a valve set at a balance point to be opened or closed but not opened beyond the balance point. Valve shall be nonrising stem type. Where used for combination shutoff and balancing service, valve shall be furnished with insulating composition handle.

2.2.5 Eccentric Plug Valves (EPV)

NOTE: Review service temperature range of dual temperature systems prior to making selection and restrict to temperatures and materials to ensure long elastomer life.

[Eccentric plug valves in sizes 2 inches DN50 and smaller shall be constructed of manufacturer's standard [brass] [bronze] materials conforming to [ASTM B 61] [ASTM B 62]. Valves shall be rated for service at 175-psi 1207 kilopascal maximum nonshock pressure at 250 degrees F 121 degrees C. Valve body shall have screwed ends. Eccentric plug surfaces in contact with flow shall be coated with a 60 to 70 Shore A durometer hardness elastomer, resistant to treated water. Valves used for combination shutoff and balancing service shall be fitted with a memory device or mechanism which shall permit a valve set at a balance point to be operated to the closed position.]

[Reopening, limited to eccentric plug valves in sizes 2-1/2 inches DN65 and larger, shall be constructed of Type 2 nickel-alloy iron conforming to ASTM A 436. Valves shall be rated for service at 175-psi 1207 kilopascal maximum nonshock pressure at 250 degrees F. 121 degrees C. Valve body shall have screwed ends. Eccentric plug surfaces shall be coated with a 60 to 70 Shore A durometer hardness elastomer, resistant to treated water. Valves used for combination shutoff and balancing service shall be fitted with a memory device. Memory device or mechanism shall permit a valve set at a balance point to be operated to the closed position, but with reopening limited to the balance point. Valves up to 6-inch ips DN150 shall be fitted with removable lever operator.]

**NOTE: Normally delete the following paragraphs.
Limit to 5-inch DN125 valves. Cross sectional area
of valve bore, when open, shall equal pipe inlet
area.**

[Valves, 6-inch ips DN150 and larger, shall be fitted with totally enclosed, flood-lubricated, worm-gear drive; operating torque shall not exceed 50 foot-pounds 68 newton meter.]

2.2.6 Ball Valves (BAV)

Ball valves shall conform to FS WW-V-35. Valves shall be [Style 1 (removal not required for inspection and repair)] [Style 3 (removal required for inspection and repair)].

NOTE: Due to the generalized approach of FS WW-V-35 and to the fact that there are more than 50 manufacturing sources of varied quality ball valves, it is suggested that the manufacturer's list of typical sources and model numbers be published as part of the specification. Typical source list should be checked for each project application.

If the following paragraph is changed, check
manufacturing sources.

[Valves shall be rated for service at not less than 175 psi at 200 degrees F
1207 kilopascal at 93 degrees C.]

Valve bodies in sizes 2-inch ips DN50 and smaller shall be
screwed-end-connection type, constructed of Class A copper alloy.

Valve bodies in sizes 2-1/2-inch ips DN50 and larger shall be flanged-end
connection type, constructed of Class [D] [E] [F] material.

Balls and stems of valves 2-inch ips DN50 and smaller shall be
[manufacturer's standard Class A copper alloy with 900 Brinell hard-chrome
plate finish] [Class C corrosion-resistant steel alloy with hard-chrome
plate.] Electroless nickel plating is acceptable.

Balls and stems of valves 2-1/2-inch ips DN65 and larger shall be
manufacturer's standard Class C, corrosion-resistant steel alloy with
hard-chrome plate. In valves 6-inch ips DN150 and larger, balls shall be
Class D with 900 Brinell hard-chrome plate. Electroless nickel-plating is
acceptable.

Valves shall be suitable for flow from either direction and shall seal
equally tight in either direction.

Valves shall have full-pipe-size flow areas.

Valves with ball seals kept in place by spring washers are not acceptable.
Valves shall have adjustable packing glands. Seats and seals shall be
tetrafluoroethylene.

Valve body construction shall be such that:

Torque from a pipe with a valve installed shall not tend to disassemble
the valve by stripping setscrews or loosening body-end inserts or
coupling nuts.

Torque from a pipe shall be resisted [by a one-piece body between end
connections] [by bolts in shear] where body is of [mating-flange]
[surface-bolted construction].

2.2.6.1 Plastic, PVC

**NOTE: Valves shall be used in industrial pressure
piping service where resistance to corrosion is of
prime importance and service temperature does not
exceed 140 degrees F 60 degrees C.**

Ball valves shall be manufactured from a PVC compound that meets the

requirements of Type 1, Grade 1 PVC as outlined in ASTM D 1784. Valves shall also conform to NSF 14 and MSS SP-86.

Valves shall have Teflon ball seals and Viton stem and body seals. Ball valves shall carry a pressure rating of 150-psi 1100 kilopascal circulating water pressure (cwp) at 75 degrees F 24 degrees C.

2.2.6.2 Plastic, CPVC

NOTE: Valves shall be used in industrial pressure piping service where resistance to corrosion is of prime importance and service temperature does not exceed 200 degrees F at 66 psi. 60 degrees C at 455 kilopascal.

Ball valves shall be manufactured from a compound which meets or exceeds the requirements for Class 23447-B CPVC in ASTM D 1784. Valves shall also conform to NSF 14 and MSS SP-86.

Valves shall have Teflon ball seals and Viton stem and body seals. Ball valves shall carry a pressure rating of 150-psi cwp at 75 degrees F 1100 kilopascal cwp at 24 degrees C.

2.2.7 Butterfly Valves (BUV)

2.2.7.1 Metal

NOTE: Review service temperature of systems prior to selection and restrict temperatures or materials as necessary to ensure long elastomer life.

The following is limited to valve sizes through 20 inches DN500. Economical selection point is 4 inches 100 millimeter and up.

Butterfly valves shall conform to MSS SP-67.

Butterfly valves shall be wafer type for mounting between specified flanges and shall be rated for 150-psig 1100 kilopascal shutoff and nonshock working pressure. Body shall be cast-ferrous metal, conforming to requirements of ASTM A 126/A 126M, Class B, and to ASME B16.1 for body wall thickness.

Face-to-face dimensions shall conform to MSS SP-67.

NOTE: Henry Pratt valves cannot conform to the following paragraph.

Valves installed in insulated piping systems shall be provided with extended bonnets placing the operator beyond the specified insulation.

Disk shall be free of external ribs and shall be streamlined. Disk shall be fabricated from [cast ferrous] [nonferrous] alloys conforming to [ASTM A 126/A 126M, Class B (cast iron)] [ASTM A 436, Type [1] [2] (austenitic cast iron)] [ASTM A 216/A 216M, Grade WCB (cast steel)] [ASTM A 395 ASTM A 395M (ductile iron)] [ASTM B 62; bronze] [ASTM B 584; bronze] [ASTM B 148; bronze].

Use of taper pins to secure the valve disc to the shaft is prohibited.

Shafts shall be fabricated from [AISI Type-00 series] [17-4 PH corrosion-resistant steel] [nickel-copper alloy] conforming to ASTM B 164, and shall be [one-piece] [stub-shaft] type. Stub shafts shall extend into the disk hub at least 1-1/2 shaft diameters except for angle disk construction. Connection between the valve shaft and disk shall be designed to transmit shaft torque equivalent to not less than 75 percent of the torsional strength of the minimum required shaft diameter. Minimum shaft diameter for all valves shall be in accordance with the following:

VALVE SIZE (INCH)	SHAFT DIAMETER (INCH)	VALVE SIZE (INCH)	SHAFT DIAMETER (INCH)
2-1/2	7/16	10	1-1/8
3	1/2	12	1-1/4
4	5/8	14	1-1/2
5	11/16	16	1-5/8
6	3/4	18	1-7/8
8	7/8	20	2-1/8
DN-VALVE SIZE (MILLIMETER)	SHAFT DIAMETER (MILLIMETER)	DN-VALVE SIZE (MILLIMETER)	SHAFT DIAMETER (MILLIMETER)
65	11	250	28
80	15	300	32
100	18	350	40
125	19	400	41
150	20	450	47
200	22	500	53

NOTE: Henry Pratt and other manufacturers are limited to 200 degrees F 93 degrees C service by

their elastomer.

Seats and seals shall be resilient-elastomer type designed for field removal and replacement. Elastomers shall be [Buna-N] [ethylene propylene terpolymer] [chloroprene], formulated for continuous immersion service at 250 degrees F 121 degrees C, minimum, and shall be applied at least 10 percent below maximum continuous service temperature. Bonding adhesives shall comply with elastomer temperature requirements and shall have an effective life equal to or greater than the elastomer.

Seals on 20-inch DN500 and smaller valves shall be designed [to use standard split-V packing, dual O-rings, and quad rings] [to be the adjustable pull-down type].

Seats may be installed in the [valve body] [on the disk] except that circular cross section O-ring construction is not acceptable.

Seat or disk matting surfaces shall be corrosion-resistant material such as austenitic gray cast iron and bronzes specified for the disk or the materials specified for stems. These materials shall be [welded to substrate and ground] [mechanically retained]. Plated or similarly applied surfacing materials are not acceptable.

NOTE: Norris will modify valve to include bearings.

Bearings shall be permanently lubricated sleeve type of manufacturer's standard corrosion-resistant [steel] [bronze] [nickel-copper alloy] [nylon] [filled tetrafluoroethylene]. Bearings shall be designed for [a pressure not exceeding the published design load for the bearing material] [one-fifth of the compressive strength of the [bearing] [shaft] material]. Operating end of the shaft shall be provided with [dual inboard bearings] [a single inboard and an outboard bearing] in or beyond the operator.

Padlocking feature shall be provided to make valve tamperproof.

For balancing service, valve operators shall have provision for infinite position locking.

Manual nonchain-operated valves through 6 inches DN150 shall be provided with not less than nine-position, lever-lock handles not exceeding 18 inches 450 millimeter in length.

Manual valves 8 inches DN200 and larger, or smaller if the application torque exceeds a pull of 80 pounds 356 newtons, shall be provided with gear operators.

Where valves are indicated to be chain operated, all sizes shall be equipped with gear operators, and chain length shall be suitable for proper storage and operation.

Gear operators shall be worm-gear type. Operator shall be totally enclosed

in a cast-iron housing, suitable for grease or oil lubrication. Gears shall be hobcut. Cast-iron-housed traveling-nut operators are acceptable MSS SP-67. Maximum manual pull on the handwheel or chain wheel shall be 80 pounds 356 newtons.

[Modulating or remotely actuated two-position service valves, shall be provided with pneumatic operators, pilot positioners, valve position indicators, boosters, and relays. Operating air supply pressure shall be per manufacturer's instructions.]

[Pneumatic operator and adjustable stroke crosslink system shall be provided for bypass operation where indicated.]

[Maximum load on a pneumatic operator shall not exceed 85 percent of rated operator capacity.]

2.2.7.2 Plastic, PVC

NOTE: Valves shall be used in industrial pressure piping service where resistance to corrosion is of prime importance and service temperature does not exceed 140 degrees F 60 degrees C.

Body and disk shall be manufactured of a PVC compound that meets the requirements of Type IO (PVC) as outlined in ASTM D 1784. Valves shall be rated bubble-tight, 150 psi for 4-, 6-, and 8-inch 1100 kilopascal for DN100, DN150, DN200 valves, and 45 psi for 10-inch 310 kilopascal for DN250 valves at 73 degrees F 23 degrees C water.

[Shaft shall be Type 316 corrosion-resistant steel.]

[Shaft shall be Type 304 corrosion-resistant steel with Penton coating.]

Seat material shall be [Buna-N] [ethylene] [propylene] [Hypalon] [Viton].

Valve body shall be of the wafer design and shall be compatible with 150-psi 1100 kilopascal ANSI flanges. Shaft shall be square in the area of the disk to allow maximum torque-carrying capacities and round in bearing and sealing areas for minimum wear. Seal shall be designed to be reversible and easily removable from the body.

Bearings shall be manufactured of polytetrafluoroethylene 25-percent glass-filled and shall be replaceable. Shaft shall have a Viton secondary seal to ensure maximum sealing characteristics. Disc shall not have holes for pins or bolts to fasten to shaft.

Valve, as supplied by the manufacturer, shall include a [lever handle with index plate] [worm-gear operator].

Valves shall carry an identification plate, securely fastened to the body, that legibly identifies the manufacturer, valve size, manufacturer's serial number, and seat and shaft material.

PART 3 EXECUTION

3.1 INSTALLATION

Valves shall be installed in accordance with the manufacturer's recommendations and in accordance with the applicable requirements of Section 15050 BASIC MECHANICAL MATERIALS AND METHODS.

-- End of Section --